

The forewing is a bright green, the costal vein being shaded with brown. Both the wings are stubby for the size of the female mantid, not surpassing the terminal portion of the abdomen. The total length of the female is 50 mm to 55 mm, the greatest length of the forewing being 25 mm. Apparently the female is not a good flier, as when one was repeatedly thrown into the air, it would flutter to the ground at an obtuse angle, and in no instance did any of the females studied exhibit prolonged flight. It is possible that it was imported into the Davis, Yolo County area, rather than arriving here by its own means of dispersal. *S. limbata* is well established in Davis, as is evidenced by the records listed below. Helfer (1963) does not list *S. limbata* from California. The specimens were determined with the key in Helfer (1963), and verified by Jacques R. Helfer of Mendocino, California.

Specimens examined.—3 malcs, 2 females, Davis, Yolo County, 24 September 1964 (J. S. Buckett and M. R. Gardner); 1 male, same locality as preceding, 16 September 1954 (L. M. Smith); 2 males, same locality as preceding, 12 September 1959 (T. H. Gantenbein); 1 male, Dinuba, Tulare County, 30 November 1957 (R. E. Rice).

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Description of Immature Stages of Three California Species of Phytoseiids Including Notes on their Biology (Acarina : Phytoseiidae)

ROBERT O. SCHUSTER

University of California, Davis

Although immature stages of many species of phytoseiids have been collected in California, their descriptions have been neglected because of difficulties in positively associating the young stages with their proper adult forms. The forms here described were collected from habitats wherein the populations comprised but one species, or they were reared from known adults. During 1964, specimens were taken from a 60-year-old vineyard of zinfandel vines located near Lodi, San Joaquin County, California. Observations on their biology were also made in this vineyard.

The immature stages of *Typhloseiopsis smithi* (Schuster), *Metaseiulus mcgregori* (Chant), and *M. occidentalis* (Nesbitt) are figured herein, and measurements of their setae are included in the descriptions. The larva of *T. smithi* was illustrated, and the larva, protonymphs, and deutonymphs were briefly described when the species was first proposed (Schuster, 1957), but few measurements were given in the original description. Chant (1958) described and figured the larva of *M. occidentalis*. None of the immature stages of *M. mcgregori* have been described heretofore.

The larvae of all three species have ten pairs of setae on the dorsal shields (nine on the anterior shield, and one on the posterior shield). In addition to a pair of vertical setae there are three pairs of medians, one pair of mediolaterals, and four pairs of laterals on the anterior section. The peritreme and fourth pair of legs do not appear until just prior to molting. On the venter there are three pairs of sternal setae, three pairs of preanal setae, and the postanal and para-anal setae. These setae are easily observed and are diagnostic.

The protonymph acquires one additional pair of prolateral setae and a pair of submarginals. One pair of postmediolateral setae, one pair of lateral setae, and the pair of clunal setae are added in the posterior region (see Fig. 2). The number of ventral setae remains the same.

Another prolateral pair of setae is added in the deutonymphal stage for a total of six pairs. Setae added to the venter are those pairs which correspond to the metasternal and genital setae of the adult females. Two pairs of preanal or ventrolateral setae are also acquired. The sexes appear to be indistinguishable until just before molting occurs, at which time the spermathecae become evident.

The numbers of setae on the tibia, genu, and femur of the larva and the protonymph are: leg I, 8-8-10; leg II, 7-6-7; leg III, 8-6-5; and leg IV (protonymph only), 6-5-4. For the deutonymph, the adult male, and the adult female these numbers are: leg I, 10-10-12 (except 11-10-12 for *T. smithi*); leg II, 7-8-9; leg III, 7-7-6; and leg IV, 6-7-6.

Two of the counts indicated above differ from those given by Evans (1963). First, genu II of the deutonymph and adult stages of all of the species have eight setae (2-2/1, 2/0,-1), instead of seven (2-2/0, 2/0-1). Second, tibia I of *T. smithi* has 11 setae (2-2/2, 2/1-2) instead of the ten setae (2-2/2, 2/0-2) typical of the family (compare Figs. 7 and 8).

The length of the dorsum is referred to as body length. This length was averaged for 25 individuals, except for the larva of *T. smithi*. The lengths of the various setae were measured for one individual only. All of the measurements are in microns.

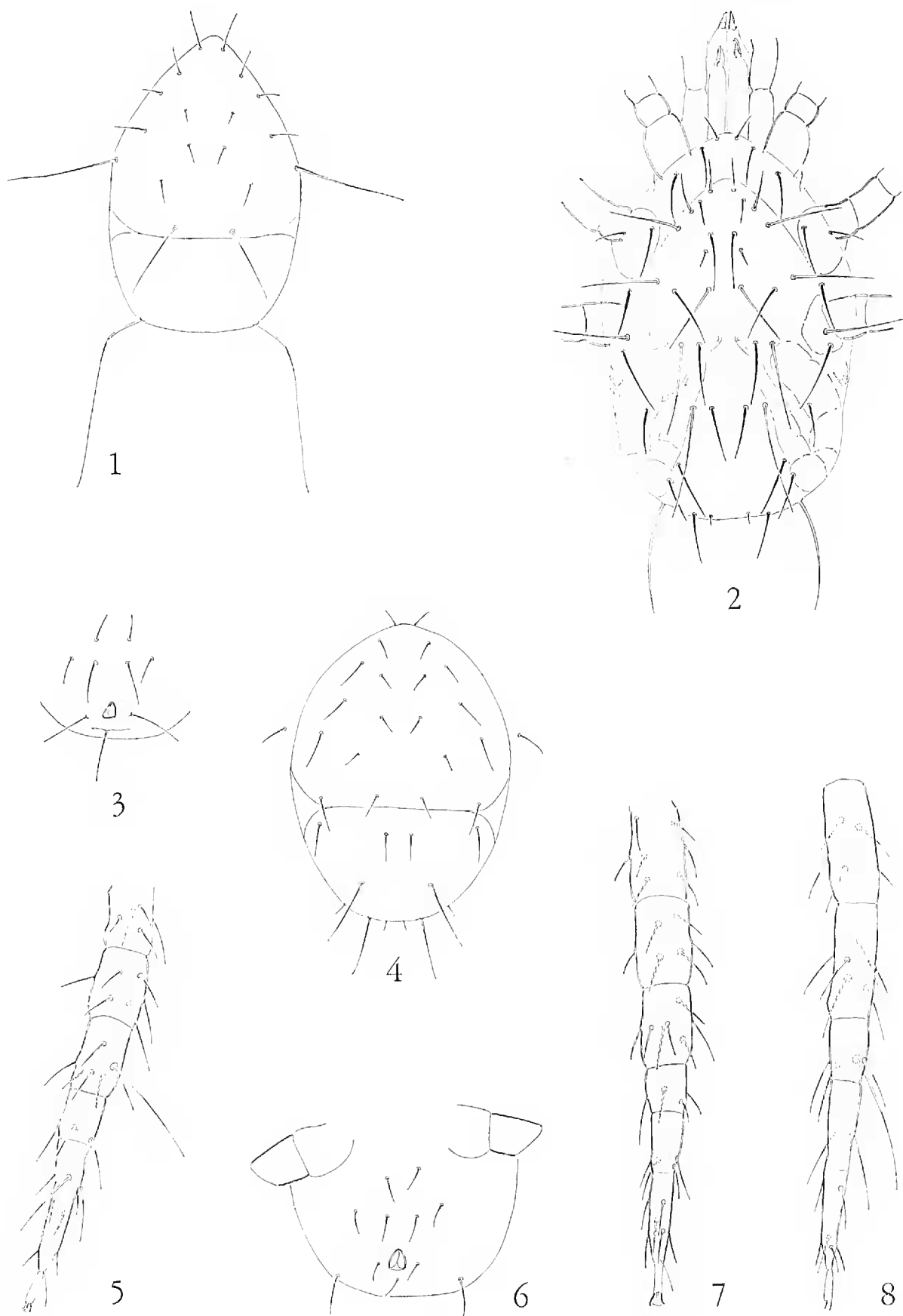


Plate I. *Typhloseiopsis smithi*—Larva, Fig. 1, dorsum; Fig. 3, venter; Fig. 5, leg dorsal view. Protonymph, Fig. 4, dorsum; Fig. 6, venter; Fig. 7, leg II ventral view; Fig. 8, leg IV ventral view. *Metaseiulus occidentalis*—Molting larva, Fig. 2, larval setae hollow, protonymphal setae solid, developing peritreme and leg IV indicated by broken line.

TYPHLOSEIOPSIS SMITHI (Schuster)

LARVA (Figs. 1, 3, 5).—Length 220. Vertical seta 34; prolateral seta I 21, II 17, III 25, IV 93; postlateral seta 150; median seta I 12, II 14, III 85; promediolateral seta 15.

The lengths of ten individuals ranged from 188 to 245, averaging 208. One specimen 212 long was molting. This length is consistent with lengths observed for the smaller protonymphs. One obvious macroseta is present on the tibia of leg III.

PROTONYMPH (Pl. I, Figs. 4, 6–8).—Length 223. Vertical seta 17; prolateral seta I, II 17, III 20, IV, V 26; postlateral seta I 28, II 14, III 48; median seta I, II 14, III 19, IV 22, V 16; promediolateral seta 14, postmediolateral seta 55; clunal seta 7; submarginal seta 23. Minimum length 212, average 235, maximum 265.

The macroseta of leg III, present in the larva, is absent in the protonymph but a similar seta occurs on the basitarsus of leg IV. This macroseta, shorter promediolateral seta, and longer fifth prolaterals make the protonymphs of *T. smithi* and *M. mcgregori* easy to separate.

DEUTONYMPH (Pl. II, Figs. 1–4).—Length 302. Vertical seta 25; prolateral seta I 30, II 20, III 29, IV, V 39, VI 41; postlateral seta I 23, II 66; median seta I 17, II 20, III 24, IV 28; clunals 8; promediolateral seta 19, postmediolaterals 60; prosublateral seta 29, postsublateral seta 41. Minimum length 262, average 293, maximum 322.

The first pair of lateral setae in the posterior region is clearly submarginal in this stage. In *M. mcgregori*, this pair of setae is clearly on the dorsal shield and the submarginal is absent.

The adults and immatures of this species were recovered from grape bark by Berlese funnel extraction. Mated females were present in a sample taken on 18 May, but immatures were not found until late June. All stages appear to remain under the bark, and the species maintained a rather uniformly low density throughout the summer. The species has been observed to feed on *Eotetranychus willamettei* (McGregor) and on *Tetranychus pacificus* McGregor in the laboratory (Schuster, 1957), but the natural prey is unknown. The appearance of greenish-colored individuals in samples taken soon after irrigation or rainfall indicates that lichen or alga may be eaten under some conditions. Reproduction increased slightly in late summer during the period when *E. willamettei* entered hibernation.

METASEIULUS MCGREGORI (Chant)

LARVA (Pl. II, Figs. 5, 6).—Length 180. Vertical setae 13, prolateral seta I 9, II, III 14, IV 48; postlateral seta 78; median seta I, II 9,

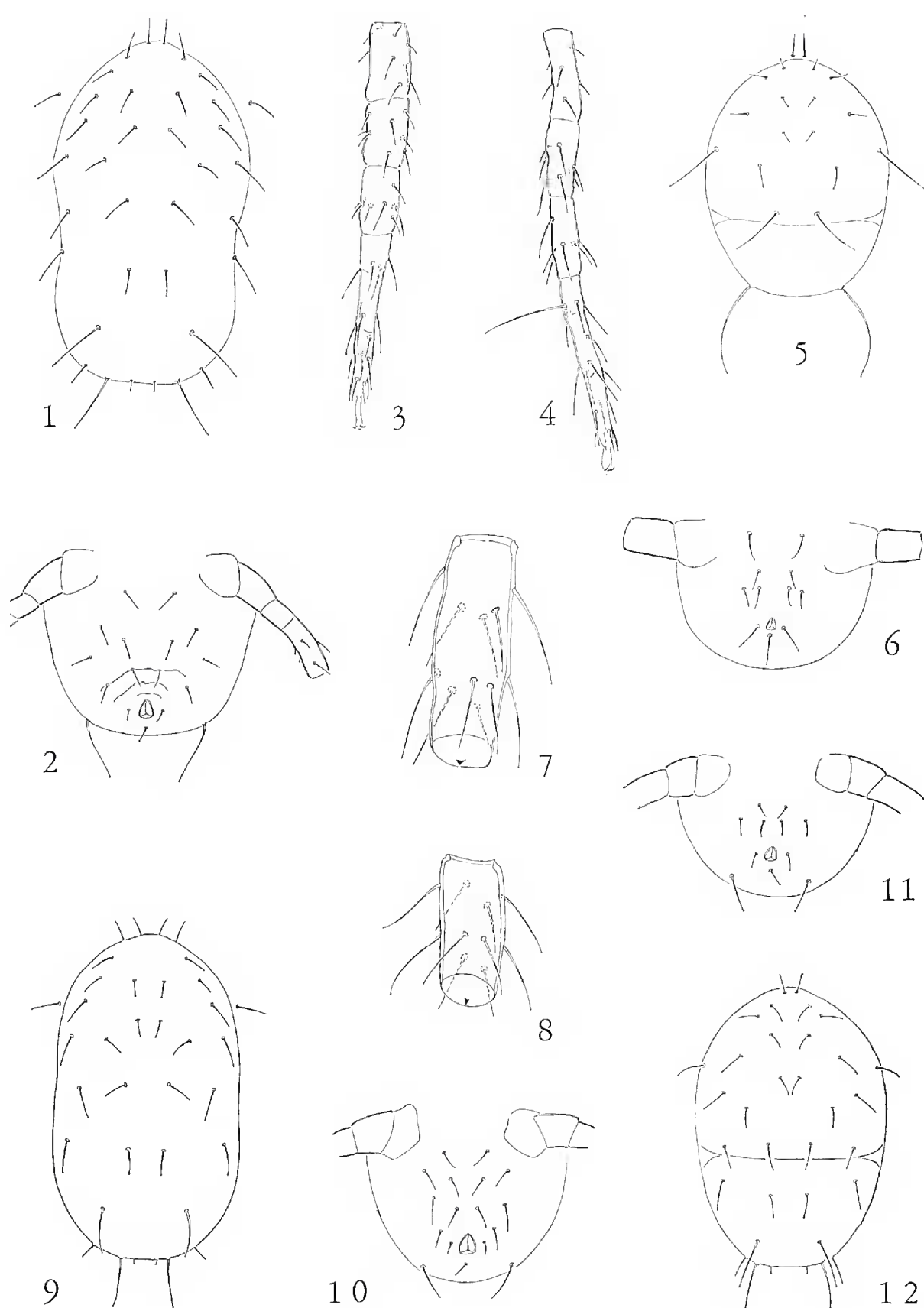


Plate II. *Typhloseiopsis smithi*—Deutonymph, Fig. 1, dorsum; Fig. 2, venter; Fig. 3, leg II dorsal view; Fig. 4, leg IV dorsal view. Adult, Fig. 7, leg I tibia ventral view. *Metaseiulus mcgregori*—Larva, Fig. 5, dorsum; Fig. 6, venter. Protonymph, Fig. 11, venter; Fig. 12, dorsum. Deutonymph, Fig. 9, dorsum; Fig. 10, venter. *Metaseiulus occidentalis*—Adult, Fig. 8, leg I tibia ventral view.

III 13; promediolateral seta 48. Minimum length 171, average 179, maximum 228.

The absence of a macroseta on leg III distinguishes this larva from that of *T. smithi*. The relative lengths of the median setae distinguish larvae of *M. mcgregori* from larvae of *M. occidentalis*. The relative lengths of the postanal and para-anal setae are also diagnostic.

PROTONYMPH (Pl. II, Figs. 11, 12).—Length 220. Vertical seta 14; prolateral seta I, II 14, III, IV 20; postlateral seta I 19, II 23, III 12, IV 17; median seta I 13, II 14, III, IV 20; clunal seta 4; promediolateral seta 14, postmediolaterals 17; submarginal setae 20. Minimum length 178, average 195, maximum 228.

The shorter dorsal setae provide a means of distinguishing the protonymph of *M. mcgregori* from that of *M. occidentalis*.

DEUTONYMPH (Pl. II, Figs. 9, 10).—Length 245. Vertical seta 17; prolateral seta I, II, III 18, IV 21, V, VI 26; postlateral seta I 26, II 14, III 38. Median seta I, II 14, III 18, IV 23; clunal seta 6; promediolateral seta 14, postmediolaterals 38; submarginal setae 21.

Minimum length 225, average 246, maximum 270.

The differences in respect to lengths of dorsal setae between this species and *M. occidentalis* are obvious at a magnification of 10 \times . Numbers and locations of leg setae are the same as illustrated for *M. occidentalis*.

The observed population occurred on grape leaves and, generally, the basal leaves of each cane. An initial population of adults slowly diminished throughout late spring and early summer, indicating inability to reproduce in the absence of a prey species. The population increased again in August when *E. willamettei* established on the vines. It decreased during October although the density of prey remained higher than at the initiation of reproduction. During six weeks, from the first part of August to the middle of September, the proportion of immatures increased from 0% to 41%. The population then was composed of 38% adult females, 21% males, and 41% immatures. The numbers of males and immatures subsequently diminished until, at the end of October, nearly 100% of the population consisted of adult females. At this time, and throughout most of November, the adults were concentrated along the main veins near the petioles. This was the only time that their distribution on the leaves was not random.

The entire population of *M. mcgregori* occurred on the leaves during the growing season. This species was primarily dependent on *E. willamettei*, although feeding on *T. pacificus* was also observed.

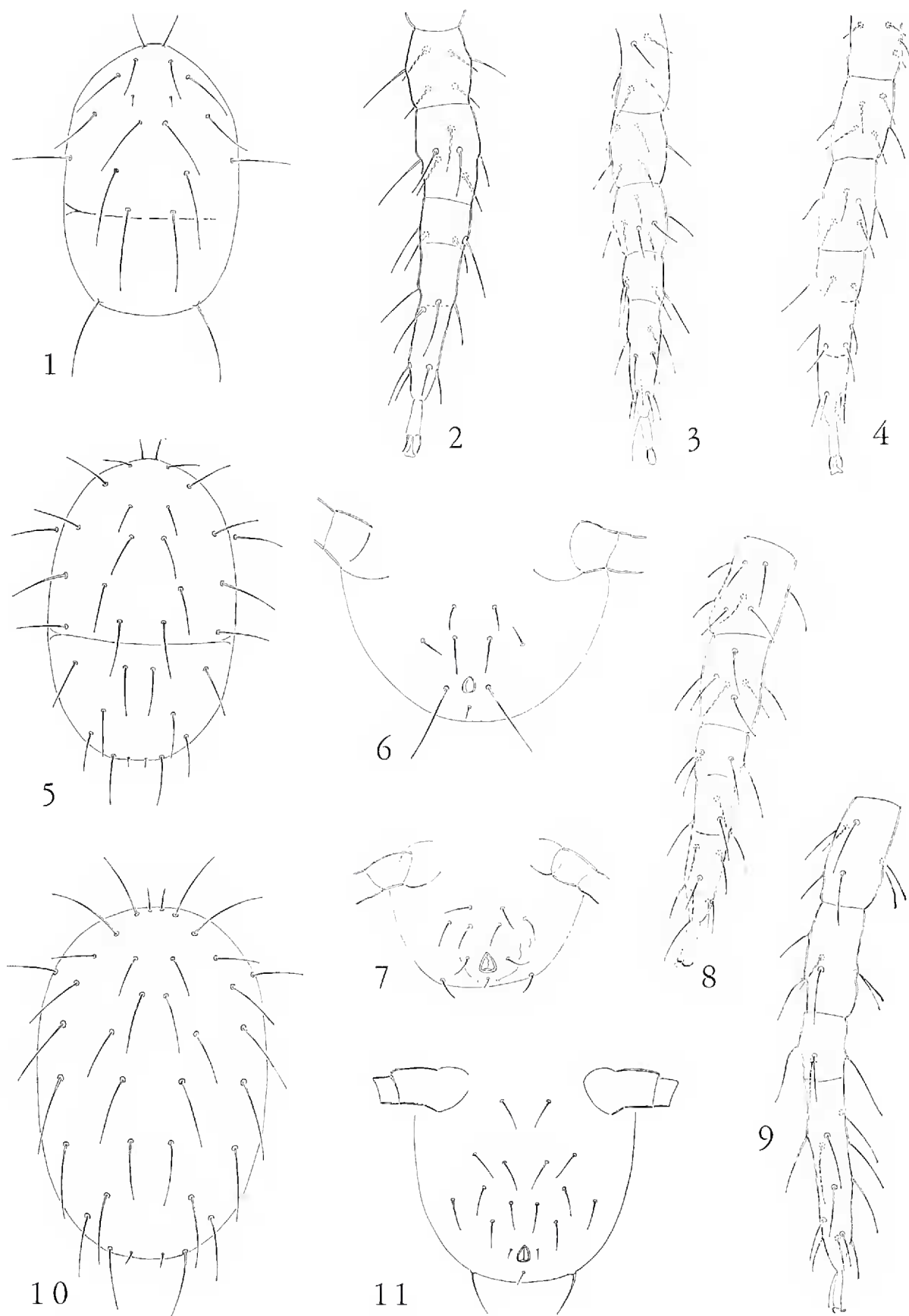


Plate III. *Metaseiulus occidentalis*—Larva, Fig. 1, dorsum; Fig. 2, leg III ventral; Fig. 6, venter. Protonymph, Fig. 3, leg II ventral view; Fig. 4, leg IV ventral view; Fig. 9, leg IV ventral view; Fig. 10, dorsum; Fig. 11, venter.

METASEIULUS OCCIDENTALIS (Nesbitt)

LARVA (Pl. III, Figs. 1, 2, 6).—Length 205. Vertical seta 29; prolateral seta I 30, II, III 48, IV 50; postlateral seta 63; median seta I 8, II 56, III 60; promediolateral seta 61. Minimum length 171, average 192, maximum 202.

Median seta I are the only very short dorsal setae. The short postanal and long para-anal setae on the ventral surface are diagnostic. None of the setae of tibia III are greatly longer than the others.

PROTONYMPH (Pl. III, Figs. 3–5, 7).—Length 225. Vertical seta 21; prolateral seta I 28, II 41, III 39, IV, V 47; clunal seta 8; submarginal seta 29. Minimum length 195, average 219, maximum 245.

The length of the first median setae of this stage is nearly equal to the lengths of its other dorsal setae, and the length of the para-anal setae is normal.

DEUTONYMPH (Pl. III, Figs. 8–11).—Length 262. Vertical seta 21; prolateral seta I 49, II 56, III 37, IV 54, V 55, VI 63; postlateral seta I 63, II, III 48; median seta I 30, II 45, III 55, IV 60; clunal seta 10; promediolateral seta 45; postmediolaterals 60; submarginal seta 41. Minimum length 225, average 256, maximum 296. The largest individual was molting.

Adults of *M. occidentalis* appeared concurrently with populations of *T. pacificus* early in August. At this time the population of *E. willamettei* had already developed to a density of 1 mite per square inch of leaf surface. Considering the wide host range of *M. occidentalis*, the prey density was assumed to be of greater importance than the prey species in influencing predator establishment. These predators were most prevalent on the distal leaves of the canes where *T. pacificus* and *E. willamettei* occurred in mixed populations. The predators were somewhat less prevalent on the basal leaves where *E. willamettei* was the only prey.

About 1 August, before *M. occidentalis* had appeared, *M. mcgregori* had been reproducing for 3 weeks, or approximately one generation. Later however, early in September, *M. occidentalis* was present in slightly greater numbers than *M. mcgregori*. The reproductive peak occurred in mid-September at which time the population of *M. occidentalis* was composed of 41% females, 16% males, and 43% immatures.

Although the composition of the two predator populations was similar, *M. occidentalis* had become the more numerous, and in a shorter period of time. Probably faster developmental rate, not greater fecundity, was responsible for the rapid increase of *M. occidentalis*. Reproduction declined with the seasonal drop in temperature and, in October, many individuals were found in the bark of the grapevines. The recovery of

gravid females and occasional larvae of *M. occidentalis* from the bark indicated that they probably fed on some of the tetranychids when the latter entered the bark to hibernate.

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- SCHUSTER, R. O. 1957. A new species of *Typhlodromus* from California (Phytoseiidae : Acarina). Pan-Pac. Entomol., 33: 203-205.
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ZOOLOGICAL NOMENCLATURE: Notice of proposed use of plenary powers in certain cases (A. [n.s.] 70)

In accordance with a decision of the 13th International Congress of Zoology, 1948, public notice is hereby given of the possible use by the International Commission on Zoological Nomenclature of its plenary powers in connection with the following case, full details of which will be found in *Bulletin of Zoological Nomenclature*, Vol. 22, Part 3, published on 13 August 1965.

(2) Designation of a type-species for *Anthanassa* Scudder, 1875 (Insecta, Lepidoptera). Z.N.(S.) 1697.

Any zoologist who wishes to comment on any of the above cases should do so in writing, and in duplicate, as soon as possible, and in any case before 13 February 1966. Each comment should bear the reference number of the case in question. Comments received early enough will be published in the *Bulletin of Zoological Nomenclature*. Those received too late for publication will, if received before 13 February 1966, be brought to the attention of the Commission at the time of commencement of voting.

All communications on the above subject should be addressed as follows: The Secretary, International Commission on Zoological Nomenclature, c/o British Museum (Natural History), Cromwell Road, London, S.W.7, England.—W. E. CHINA, *Assistant Secretary to the International Commission on Zoological Nomenclature*.